

Claims

[1] A variable optical attenuator having at least a pair of optical transmission lines optically coupled, wherein all or a part of luminous flux coming out of one optical transmission line of the paired optical transmission lines is optically coupled to the other of the paired optical transmission lines, comprising:

a light transmissive member is arranged in an optical path that the optical transmission lines are optically coupled so that the member is allowed to change an angle thereof.

[2] The variable optical attenuator according to claim 1, wherein an angle of the light transmissive member is changed to vary at least one angle of angles that the luminous flux coming out of one optical transmission line of the paired optical transmission lines enters the light transmissive member and that it comes out of the light transmissive member.

[3] The variable optical attenuator according to claim 1, wherein the light transmissive member is capable of changing an angle thereof about a rotating shaft which is oriented in a direction vertical to a plane including each of optical axes of the paired optical transmission lines.

[4] The variable optical attenuator according to claim

1, wherein a lens or a diffraction grating which controls incoming and outgoing luminous flux is disposed at a position facing an end face of the each of the optical transmission lines.

[5] The variable optical attenuator according to claim 1, comprising an actuator which changes an angle of the light transmissive member.

[6] The variable optical attenuator according to claim 1, comprising a monitor module which senses an attenuation of luminous flux that comes out of one optical transmission line of the paired optical transmission lines and enters the other optical transmission line.

[7] The variable optical attenuator according to claim 1, wherein when luminous flux passes through the light transmissive member, a plane to which luminous flux enters the light transmissive member and a plane from which luminous flux comes out of the light transmissive member are configured of planes in parallel with each other.

[8] The variable optical attenuator according to claim 1, comprising two or more pairs of optical transmission lines optically coupled,

wherein a single light transmissive member is disposed so as to intersect across individual optical paths which optical couple the paired optical transmission lines to each other.

[9] The variable optical attenuator according to claim 1, comprising two or more pairs of optical transmission lines optically coupled,

 wherein a light transmissive member is disposed separately in individual optical paths which optical couple the paired optical transmission lines to each other.

[10] The variable optical attenuator according to claim 1, comprising two or more pairs of optical transmission lines optically coupled,

 wherein when luminous flux passes through the light transmissive member, at least one plane of a plane to which luminous flux enters the light transmissive member and a plane from which luminous flux comes out of the light transmissive member is a curved face or a bent face.

[11] The variable optical attenuator according to claim 1,

 wherein the individual optical transmission lines are disposed in parallel with each other and in one piece,

 the attenuator has an optical component which returns and optically couples luminous flux coming out of one optical transmission line of the paired optical transmission lines to the other optical transmission line of the paired optical transmission lines, and

 the light transmissive member is disposed between each of the optical transmission lines and the returning

optical component.

[12] The variable optical attenuator according to claim 11,

wherein when luminous flux passes through the light transmissive member, a plane to which luminous flux enters the light transmissive member and a plane from which luminous flux comes out of the light transmissive member are both configured of planes, and

the plane from which luminous flux comes out is tilted with respect to the plane to which luminous flux enters.

[13] The variable optical attenuator according to claim 11, wherein luminous flux coming out of one optical transmission line of the paired optical transmission lines passes through twice the light transmissive member in an optical path from one optical transmission line toward the returning optical component and in an optical path that is reflected at the returning optical component toward the other optical transmission line of the paired optical transmission lines.

[14] The variable optical attenuator according to claim 12, wherein when luminous flux passes through the light transmissive member, a plane to which luminous flux enters the light transmissive member and a plane from which luminous flux comes out of the light transmissive member

are configured of planes in parallel with each other.

[15] The variable optical attenuator according to claim 11, comprising two or more pairs of optical transmission lines optically coupled,

wherein the individual optical transmission lines are arranged in a line at a constant pitch.

[16] The variable optical attenuator according to claim 11, comprising two or more pairs of optical transmission lines optically coupled,

one optical transmission line of each of the paired optical transmission lines is arranged in a line, and the other optical transmission line of each of the paired optical transmission lines is arranged in a line, and

an arranged direction of one optical transmission line and an arranged direction of the other optical transmission line are in parallel with each other.